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ABSTRACT

This study investigates the relationship between teacher verbal maze rate and student learning and the threshhold levels of maze rate on the perceived quality of teaching. The direct and mediated effects of maze rate on achievement are examined. A randomized group design with ten levels of the independent variable teacher maze rate was used. There were significant correlations between maze rate and mean student perception, between mean student perception and mean achievement, and between maze rate and mean achievement. As a result of this and previous studies, it is concluded that student achievement and perceived teaching quality decrease monotonically with increasing maze rate, that any threshhold levels of the effects of mazes occur between zero and 1.66 mazes per minute, and that student perception is a better zero predictor of student achievement than is the direct effect of mazes.
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AN ANALYSIS OF THE DIRECT AND MEDIATING EFFECTS OF A TEACHER BEHAVIOR ON STUDENT ACHIEVEMENT

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Abstract

The purpose of this study was to determine the relationship between teacher verbal maze rate and student learning, the threshhold levels of maze rate on achievement, the effect of maze rate on the perceived quality of teaching, and to compare direct and mediated effects of maze rate on achievement. The authors used a randomized group design (N=227) with ten levels of the independent variable, teacher verbal maze rate. There were significant correlations ($p < .005$) between maze rate and mean student perception ($r = -.88$), between mean student perception and mean achievement ($r = .93$), and between maze rate and mean achievement ($r = -.86$). As a result of the present and previous studies, the authors concluded that student achievement and perceived teaching quality decrease monotonically with increasing maze rate, that any threshhold levels of the effects of mazes occur between zero and 1.66 mazes per minute, and that student perception is a better predictor of student achievement than is the direct effect of mazes.

Communication in the classroom is highly dependent upon the spoken word. That there are numerous ways of communicating unclearly has led to the cliche, "If something can be misunderstood, it will be." It is not surprising, then, that Rosenshine and Furst (1971) reported that the most promising correlation between a teacher behavior (process) and student achievement (product) was teacher clarity, a high inference behavior.

The overwhelming majority of process-product studies have been descriptive rather than experimental, and have dealt with high inference measures rather than specific, observable behaviors (low inference measures). Thus, many of the specific, observable behaviors underlying teacher clarity are not known. Land and Smith (1979) have identified teacher mazes as one low inference variable of teacher clarity. Mazes are false starts or halts in speech, redundantly spoken words, and tangles of words. On the average, teachers produce almost three mazes per minute of speech (Smith, 1977). Land and Smith (1979) found a significant difference between student learning under a high clarity condition (no teacher mazes) and a low clarity condition (5.1 mazes per minute). More recently, Land (in press) has obtained data which suggest that a medium clarity condition (3.8 mazes/min. in a cluster of two variables) may actually produce more student learning than either the low clarity or high clarity conditions. He speculated that the relation between frequency of mazes and student learning is curvilinear.

The present study focused on the following questions.

What is the relation (linear, curvilinear) between maze rate and learning? What are the threshhold levels, if any, of the effect of the rate of mazes on student achievement? What is the effect of varying maze rate on the perceived quality of teaching?

Method

The authors used a randomized group design with ten levels of the independent variable, rate of teacher mazes (See Table 1). The variation in maze rate ranged systematically from zero to 6.99 mazes per minute. This was done by videotaping 10 lessons which varied only in maze rate. The lessons were concerned with a relational construct consisting of eight rules and were approximately ten minutes in duration. The same content was used in the same sequence in all lessons, the only difference being in the rate of occurrence of teacher verbal mazes.

The participants were 227 undergraduate psychology and education students at Missouri Southern State College. They were distributed into the 10 lesson conditions; the average number in each condition was 23 students. Approximately 60% of the participants were female, and over 90% were of Caucasian ancestry. All participants were asked to view a lesson, evaluate the teaching, and then take a test over the contents of the lesson. After viewing the lesson, each participant rated the teaching on a 10-item scale (Smith and Land, in press). With this scale, students rated the lesson on such variables as teacher confidence, the clarity of explanations, how well the teacher

stayed on the subject, how well the teacher was prepared, etc. Immediately after completing the rating scale, the students completed a 20-item criterion-referenced test covering the contents of the lesson. The test had previously been shown to yield a Spearman-Brown split-half reliability coefficient of .84.

Results

Student achievement tended to decrease as the maze rate increased (Table 1, Figure 1). The highest mean score for achievement (16.1 out of a possible 20) was obtained in the no maze condition. The lowest mean score (13.0) was obtained with the relatively high maze rate of 5.46 per min. Correlating mean achievement scores with maze rates, yields a coefficient, r, of -.86 ($p < .005$; Figure 1). Interestingly, the standard deviations between individuals within each maze rate condition tended to be relatively large, for example, 3.1 in the no mazes condition (Table 1). Since achievement appears to decrease most rapidly with increasing maze rate toward the low end of the scale of maze rates, the plot of mean achievement vs. maze rate was fit with a curvilinear (power) function. The correlation of this function with the observed mean achievement values is -.90 (Figure 2).

The perceived quality of teaching also tended to decrease as the maze rate increased (Table 1, Figure 1). The highest

mean rating of quality of teaching (30.5, out of a possible 40) was obtained in the no maze condition. The lowest mean rating (18.5) was obtained with the highest maze rate, 6.99 per min. Correlating mean ratings of teaching quality with maze rates yields a coefficient of -.88 ($p < .005$; Figure 1). The plot of maze rate vs. ratings of teaching quality was also fit with a power function (Table 1). The correlation of this function with the observed values is -.97.

Both achievement and perceived quality of teaching tended to decrease together as maze rate increased. Correlating mean achievement with mean ratings of teaching quality yields a coefficient of .93, ($p < .005$); (Figure 1).

The average student perception scores were found to correlate more highly with mean achievement scores (.93), than did the teacher behavior (maze rate) itself (-.86). While this difference may appear small, a partial regression analysis indicates that 51% of the total variance shared between perception and achievement is independent of the variance in maze rate. On the other hand, only 6% of the variance shared between maze rate and achievement is independent of variance in perception. These estimates are squared first-order partial correlation coefficients. The first is significantly greater than zero ($t_7 = 2.69$, $p < .025$), while the second is not.

Discussion

The present findings indicate that student achievement and perceived teaching quality decrease comparably as maze rate

increases. The specific forms of these decreasing functions, however, are not entirely clear.

Linear regressions of mean achievement and mean perceived quality of teaching with maze rate yield satisfactory r values (-.86 and -.88, respectively). These values are only slightly improved by use of the curvilinear power functions (-.90 and -.97). Nonetheless, the curvilinear description seems more consistent with the fact that both achievement and rated teaching quality decrease rapidly as the maze rate increases from zero to 1.66 per min., but do not decrease appreciably above rates of about 4.65 per min.

The present findings do not support the initial suggestion (Land, in press) that a medium rate of maze production yields better performance than a high or a low rate. These data reveal that both achievement and perceived teaching quality tend to decrease monotonically with increasing maze rates.

The relatively large standard deviations obtained for achievement scores within each maze rate condition suggest the possibility that some students may be affected more greatly than others by increasing maze rates. Some support for this idea is obtained by rank ordering the scores in each maze rate condition and separating those in the upper, middle, and lower third of the rankings. If the means for the upper third in each of the 10 conditions are correlated with maze rate, a coefficient of -.57 is obtained, and the slope for a linear regression is -.27. If the means for the middle third are correlated with maze rate, they yield a coefficient of -.75, and

a corresponding slope of -.34. The lower third yields a coefficient of -.82, and a slope of -.50. The systematic character of these findings suggests that the achievement of "poorer" students undergoes notably more disruption due to increase in maze rate than does the achievement of the "better" students.

One further point of interest concerns the fact that mean achievement scores share more variance in common with mean teaching perception scores (exclusive of maze rate, 51%) than with maze rate (exclusive of perception scores, 6%). This would suggest the obvious possibility that student perception of the teacher may itself be a causal agent in student achievement. Such a suggestion has in fact been proposed by Stayrook, Corno, and Winne (1978). It may, however, be that student perception scores reflect the student's estimate of his own potential achievement. Thus the student may be rating his own confidence to a greater degree than he is rating teaching quality. Some support for this view is found in the fact that the proportion of variance shared between perception of teaching quality and maze rate, exclusive of achievement (18%), is considerable less than that shared between perception and achievement, exclusive of maze rate (51%).

As a result of this study, the authors concluded that student achievement decreases monotonically with increasing maze rate; that any threshhold levels of the effects of mazes occur between zero and 1.66 mazes per minute, and that perceived teaching quality decreases monotonically with increasing maze rate. In addition, evidence from the present study, considered with that from previous studies (Land and Smith, 1979; Land, 1979), indicates that student perception is a better predictor

of student achievement than the direct effect of teacher mazes.

The single most important recommendation for teacher educators arising from this study is that they should focus more attention on manageable skills that can be observed, quantified, and objectively critiqued by a skilled supervisor. In the area of teacher clarity, this would involve assisting preservice and inservice teachers in reducing their use of verbal mazes.

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TABLE 1

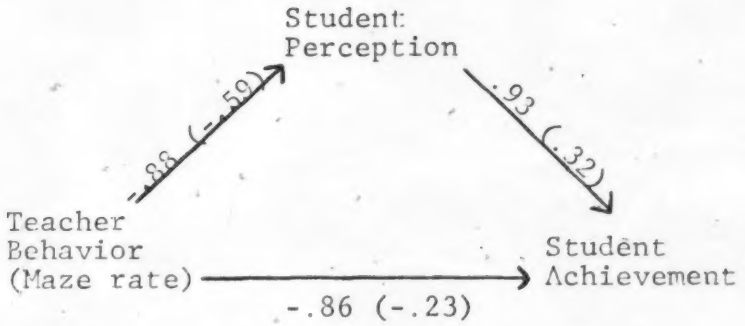
Experimental Conditions, Student Achievement, and Student Ratings of Teaching Quality

	A	B	C	D	E	F	G	H	I	J
Total number of mazes	0	5	10	15	20	25	30	35	40	45
Number of mazes per minute	0	0.77	1.66	2.34	3.08	3.82	4.65	5.46	6.14	6.99
Mean achievement score	16.1 (3.1)[a]	15.3 (3.2)	14.5 (2.8)	15.1 (3.1)	13.6 (2.7)	14.3 (3.3)	13.5 (3.0)	13.0 (5.0)	14.1 (2.2)	13.2 (3.6)
Mean rating of teaching quality	30.5 (3.7)[a]	27.9 (3.3)	22.2 (4.7)	23.1 (4.6)	21.3 (4.2)	21.1 (4.0)	18.7 (4.6)	19.3 (3.2)	20.1 (4.4)	18.6 (3.2)

a: Standard deviations are given in parentheses.

FIGURE 1

Correlations between maze rate, mean levels of student achievement, and mean ratings of perceived teacher quality for 10 maze rate conditions. Numbers in parentheses are correlations based on individual student scores (N=227). All values are significant at the .005 level or above.



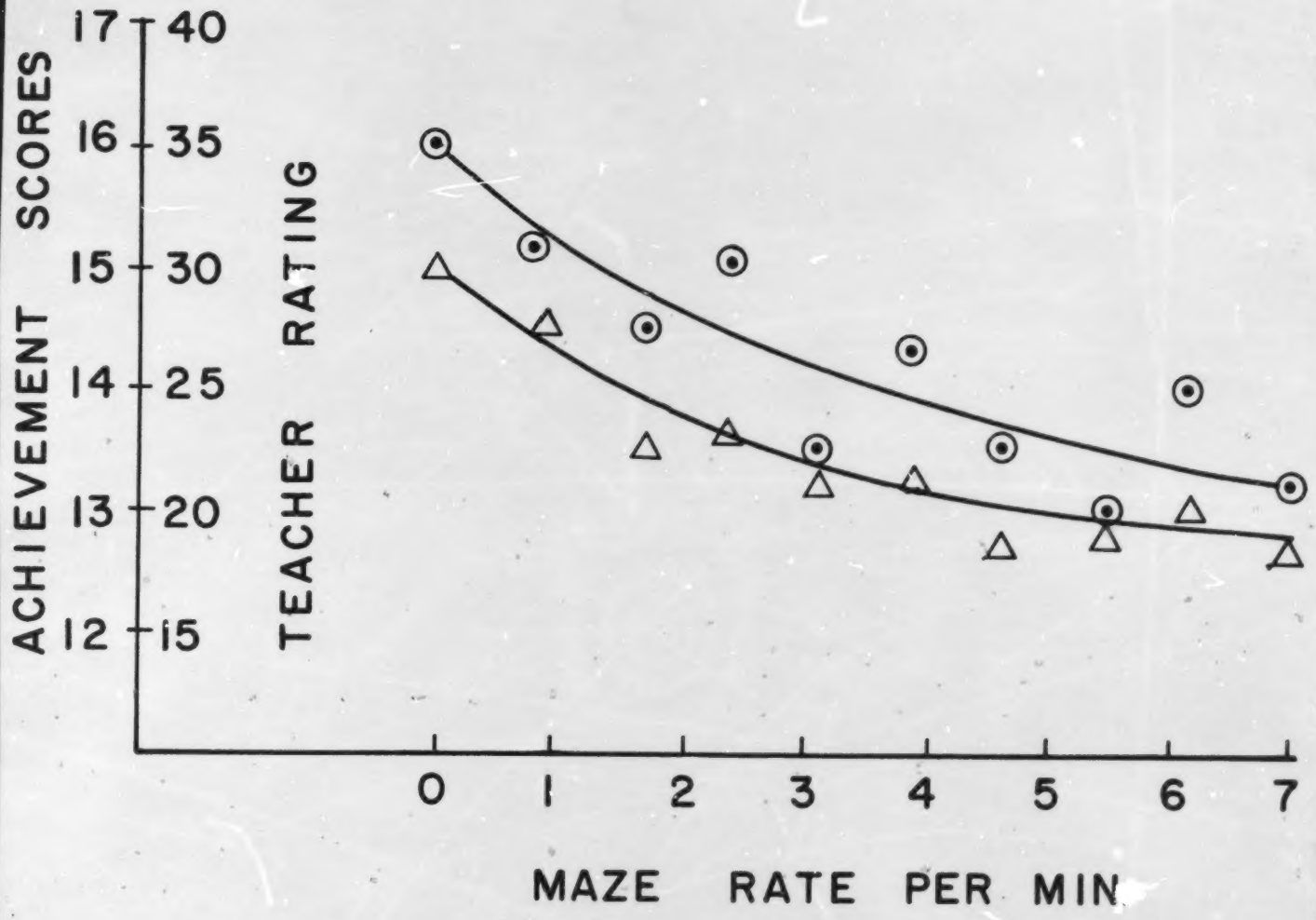

ACHIEVEMENT SCORES
17
16
15
14
13
12
TEACHER RATING
40
35
30
25
20
15
0
1
2
3
4
5
6
7
MAZE RATE PER MIN.

Figure 2

Mean achievement scores (⊙) and mean teacher ratings (Δ) are plotted against maze rate for 10 maze rate conditions. The curves are best fit power functions.